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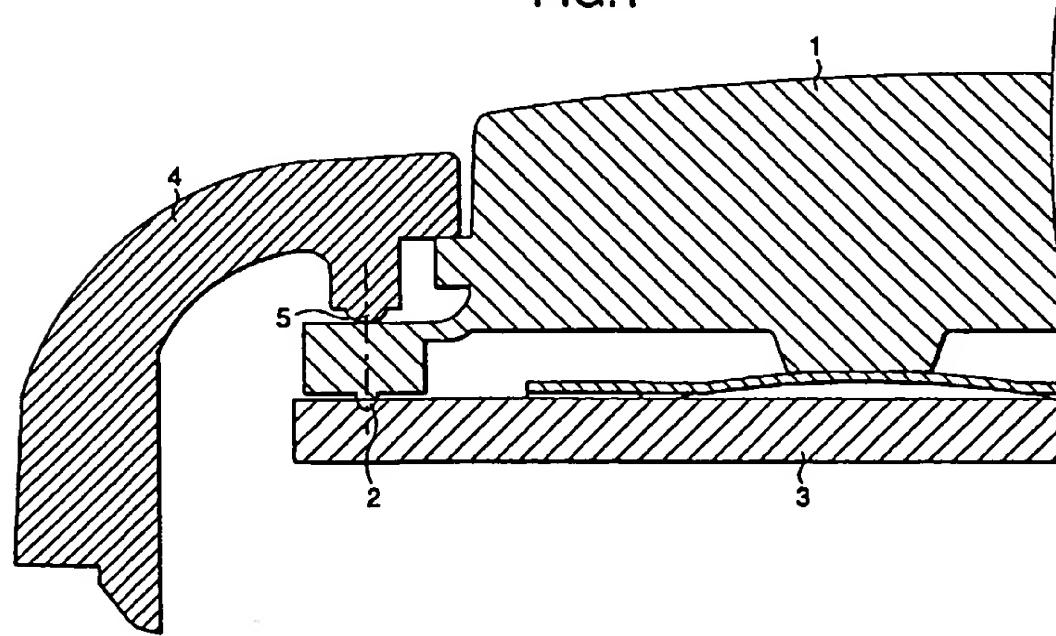
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## (54) Portable terminal device

(57) A water-proof structure of a key sheet periphery portion of a portable terminal device. The device includes an upper cover having a rib with a substantially convex cross-section provided around an operating portion, a printed board for receiving an operation input from the operating portion, and a key sheet provided be-

tween the upper cover and the printed board, having a rib with a substantially convex cross-section provided contacting with the printed board with a center shared with the rib with the substantially convex cross-section provided in the upper cover. The key sheet is provided with input buttons (key top) constituting the operating portion.

FIG.1



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**Description****BACKGROUND OF THE INVENTION****1. Field of the Invention**

[0001] The present invention relates to a portable terminal device and in particular, it relates to one provided with a water-proof structure with improved assembling property and water-proof property so as to prevent entrance of water or the like from the periphery of an operating portion into the inside of the main body of the device.

**2. Description of the Related Art**

[0002] Conventionally, as portable terminal devices, such as a portable phone device and a PHS, one shown in FIGS. 5A and 5B has been known. That is, according to the water-proof structure of the key sheet periphery portion of the portable terminal device shown in FIG. 5B, a rib 12 is provided in a key sheet 11 made from a silicone rubber, with the rib 12 contacting with an upper cover 10 so as to prevent entrance of water or the like from the surface portion of the key sheet 11 into the inside of the main body of the device, such as a printed board 13. FIG. 5A is an enlarged view of the portion of the FIG. 5B surrounded by the two-dot chain line, showing an example of the rib 12 accurately contacting with the upper cover 10.

[0003] Recently, tasks such as a small size, a light weight and weight reduction of a portable terminal device have been the principal part in designing portable terminal devices. With the conventional shapes, it is difficult to achieve the tasks. That is, with the conventional water-proof structure of the key sheet periphery portion of the portable terminal device, the surface of the upper cover 10 contacting with the rib 12 is narrow, and thus a problem arises in that the water-proof property becomes insufficient in the case the rib 12 provided in the key sheet 11 is displaced in handling the key sheet of the portable terminal device as shown in FIGS. 6A and 6B.

**SUMMARY OF THE INVENTION**

[0004] In order to solve the above problem, an object of the invention is to provide a portable terminal device provided with a water-proof structure with improved assembling property and water-proof property so as to prevent entrance of water or the like from the periphery of an operating portion into the inside of the main body of the device.

[0005] In order to achieve the above object, according to a first aspect of the invention, there is provided a portable terminal device comprising: an upper cover having a rib with a substantially convex cross-section provided around an operating portion; a printed board for receiv-

ing an operation input from the operating portion; and a water-proof member provided between the upper cover and the printed board, having a rib with a substantially convex cross-section provided contacting with the printed board with a center shared with the rib with the substantially convex cross-section provided in the upper cover.

- [0006] According to a second aspect of the invention, there is provided a portable terminal device comprising: an upper cover having a rib with a substantially convex cross-section provided around an operating portion; a printed board for receiving an operation input from the operating portion; and a key sheet provided with input buttons constituting the operating portion, provided between the upper cover and the printed board, having a rib with a substantially convex cross-section provided contacting with the printed board with a center shared with the rib with the substantially convex cross-section provided in the upper cover.

- [0007] FIG. 1 is an enlarged cross-sectional view showing a part of the configuration of a portable terminal device according to an embodiment of the invention.
- [0008] FIG. 2 is an exploded perspective view showing the configuration of the portable terminal device according to the embodiment of the invention, such as a portable phone device.

- [0009] FIG. 3 is a cross-sectional view showing a part of the configuration of the portable terminal device according to the embodiment of the invention.

- [0010] FIGS. 4A and 4B are exploded plan views showing the configurations of ribs each elongating around the entire periphery of an operating portion of the embodiment of the invention without interruption.

- [0011] FIGS. 5A and 5B are cross-sectional views showing a part of the configuration of a conventional portable terminal device.

- [0012] FIGS. 6A and 6B are cross-sectional views showing the state of displacement generated by handling a key sheet in the conventional configuration.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

[0013] Hereinafter, an embodiment of the invention will be described with reference to the accompanying drawings.

- [0014] FIG. 1 is an enlarged cross-sectional view showing a part of the configuration of a portable terminal device according to an embodiment of the invention. In FIG. 1, the water-proof structure of the key sheet periphery portion of the portable terminal device comprises an upper cover 4 having a rib 5 with a substantially convex cross-section provided around an operating portion, a printed board 3 for receiving the operation input from the operating portion, and a key sheet 1 provided between

the upper cover 4 and the printed board 3, having a rib 2 with a substantially convex cross-section provided contacting with the printed board 3 with the center shared with the rib 5 with the substantially convex cross-section provided in the upper cover 4.

[0015] The key sheet 1 is provided with input buttons (key top) comprising the operating portion. Moreover, since the input buttons (key top) comprising the operating portion are a switch, the configuration including the rib 2 of the key sheet 1 to be the breakwater for preventing entrance of water or the like into the switch serves as a water-proof member.

[0016] Furthermore, the key sheet 1 and the rib 2 with the substantially convex cross-section provided therein are made from one material as shown in FIG. 1, that is, made of an elastic member such as a silicone rubber.

[0017] Moreover, as shown in FIG. 1, the rib 2 provided in the key sheet 1 has a substantially V-shaped cross-section smaller than that of the rib 5 provided in the upper cover 4. The rib 5 has a substantially half circular cross-section, with the cross-sectional area larger than that of the rib 2. According to the rib 2 having the substantially V-shaped cross-section, even when the key sheet 1 is deformed by the key operation, since the tip portion of the V-shape bites into the printed board deeply, the key sheet 1 can rapidly restore the original position without dislocation. In this context, the rib 2 having the substantially convex cross-section has a compression margin with respect to the printed board 3.

[0018] FIG. 2 is an exploded perspective view showing the configuration of the portable terminal device according to the embodiment of the invention, such as a portable phone device. In the portable terminal device shown in FIG. 2, the rib 5 with a substantially convex cross-section provided in the upper cover 4 elongates around the entire periphery of the operating portion without interruption. Moreover, the rib 2 with a substantially convex cross-section provided contacting with the printed board 3 in the water-proof member, that is, the key sheet 1 is provided, with the center shared with the rib 5 with a substantially convex cross-section provided in the upper cover 4, elongating around the entire periphery of the operating portion without interruption.

[0019] FIG. 3 is a cross-sectional view showing a part of the configuration of the portable terminal device according to the embodiment of the invention like FIG. 1, but of a range wider than that of FIG. 1. As shown in FIG. 3, the above-described ribs are provided in the upper cover 4 and the key sheet 1 per each input button (key top).

[0020] FIGS. 4A and 4B show the configurations of the rib 5 and the rib 2 each elongating around the entire periphery of the operating portion without interruption shown in FIG. 2. That is, FIG. 4A shows the configuration of the rib 5 provided in the upper cover 4, and FIG. 4B shows the configuration of the rib 2 provided in the key sheet 1.

[0021] As apparent from the above description, the in-

vention provides a portable terminal device comprising an upper cover having a rib with a substantially convex cross-section provided around an operating portion, a printed board for receiving the operation input from the operating portion, and a water-proof member provided between the upper cover and the printed board, having a rib with a substantially convex cross-section provided contacting with the printed board with the center shared with the rib with the substantially convex cross-section provided in the upper cover, so that the effect of preventing entrance of water or the like from the periphery of the operating portion into the inside of the main body of the device can be achieved.

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### Claims

#### 1. A portable terminal device comprising:

20 an upper cover having a rib with a substantially convex cross-section provided around an operating portion;  
a printed board for receiving an operation input from the operating portion; and  
25 a water-proof member provided between the upper cover and the printed board, having a rib with a substantially convex cross-section provided contacting with the printed board with a center shared with the rib with the substantially convex cross-section provided in the upper cover.

30 2. The portable terminal device according to claim 1,  
wherein the rib with the substantially convex cross-  
section provided in the upper cover elongates  
around an entire periphery of the operating portion  
without interruption.

35 3. The portable terminal device according to claim 1,  
wherein the rib with the substantially convex cross-  
section provided contacting with the printed board  
in the water-proof member is provided, with the  
center shared with the rib with the substantially con-  
vex cross-section provided in the upper cover, elon-  
gating around an entire periphery of the operating  
portion without interruption.

40 4. The portable terminal device according to claim 1,  
wherein the water-proof member and the rib with  
the substantially convex cross-section provided  
therein are made of an elastic member.

45 5. The portable terminal device according to claim 1,  
wherein the rib with the substantially convex cross-  
section provided contacting with the printed board  
in the water-proof member is provided with a com-  
pression margin with respect to the printed board.

6. The portable terminal device according to claim 1,  
wherein the rib provided in the upper cover has a  
substantially half circular cross-section and the rib  
provided in the water-proof member has a substan-  
tially V-shaped cross-section, with an area formed  
by the half circle set larger than an area formed by  
the V shape. 5

7. A portable terminal device comprising:

an upper cover having a rib with a substantially  
convex cross-section provided around an oper-  
ating portion;  
a printed board for receiving an operation input  
from the operating portion; and  
a key sheet provided with input buttons consti-  
tuting the operating portion, provided between  
the upper cover and the printed board, having  
a rib with a substantially convex cross-section  
provided contacting with the printed board with  
a center shared with the rib with the substan-  
tially convex cross-section provided in the up-  
per cover. 10

a printed board for receiving an operation input  
from the operating portion; and  
a key sheet provided with input buttons consti-  
tuting the operating portion, provided between  
the upper cover and the printed board, having  
a rib with a substantially convex cross-section  
provided contacting with the printed board with  
a center shared with the rib with the substan-  
tially convex cross-section provided in the up-  
per cover. 15

a printed board for receiving an operation input  
from the operating portion; and  
a key sheet provided with input buttons consti-  
tuting the operating portion, provided between  
the upper cover and the printed board, having  
a rib with a substantially convex cross-section  
provided contacting with the printed board with  
a center shared with the rib with the substan-  
tially convex cross-section provided in the up-  
per cover. 20

8. The portable terminal device according to claim 7, 25  
wherein the rib with the substantially convex cross-  
section provided in the upper cover elongates  
around an entire periphery of the operating portion  
without interruption.

9. The portable terminal device according to claim 7,  
wherein the rib with the substantially convex cross-  
section provided contacting with the printed board  
in the key sheet is provided, with the center shared  
with the rib with the substantially convex cross sec-  
tion provided in the upper cover, elongating around  
an entire periphery of the operating portion without  
interruption. 30

10. The portable terminal device according to claim 7, 40  
wherein the key sheet and the rib with the substan-  
tially convex cross-section provided therein are  
made of an elastic member.

11. The portable terminal device according to claim 7, 45  
wherein the rib with the substantially convex cross-  
section provided contacting with the printed board  
in the key sheet is provided with a compression  
margin with respect to the printed board.

12. The portable terminal device according to claim 7,  
wherein the rib provided in the upper cover has a  
substantially half circular cross-section and the rib  
provided in the key sheet has a substantially V-  
shaped cross-section, with an area formed by the  
half circle set larger than an area formed by the V  
shape. 50 55

FIG.1

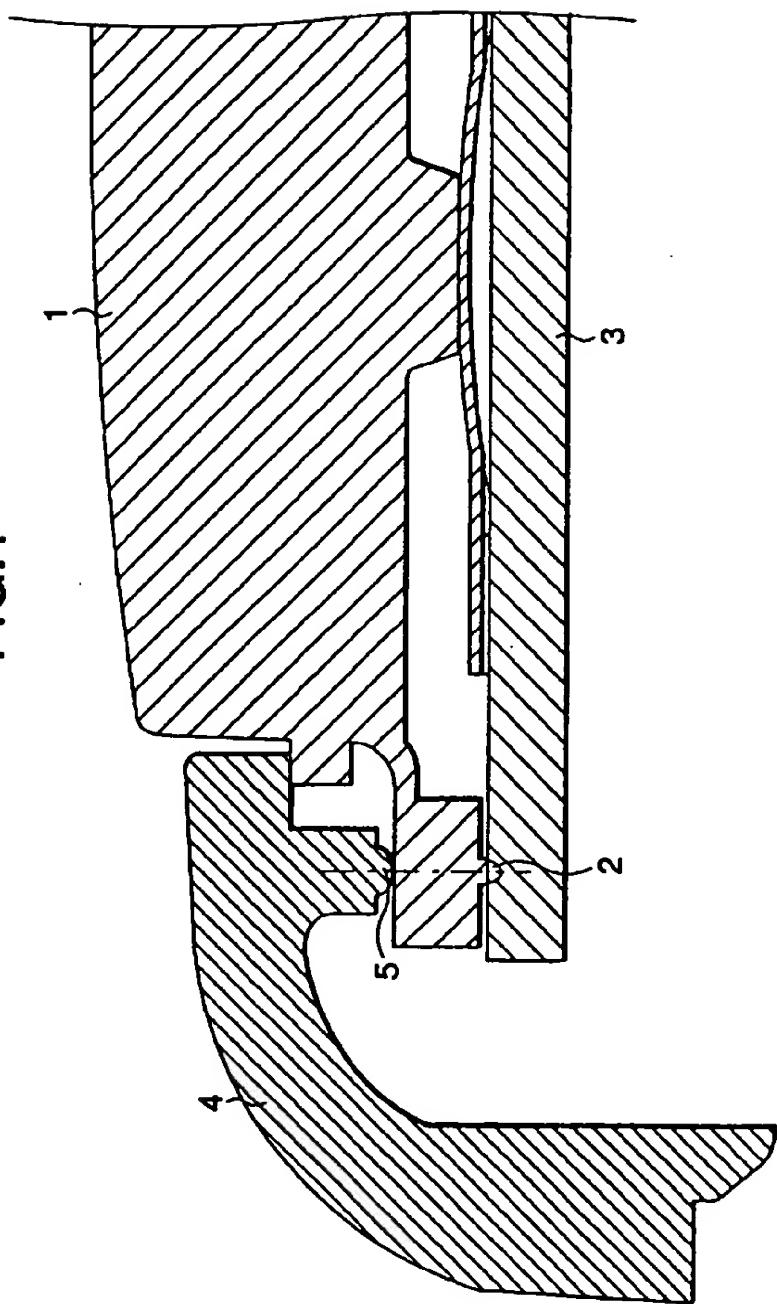


FIG.2

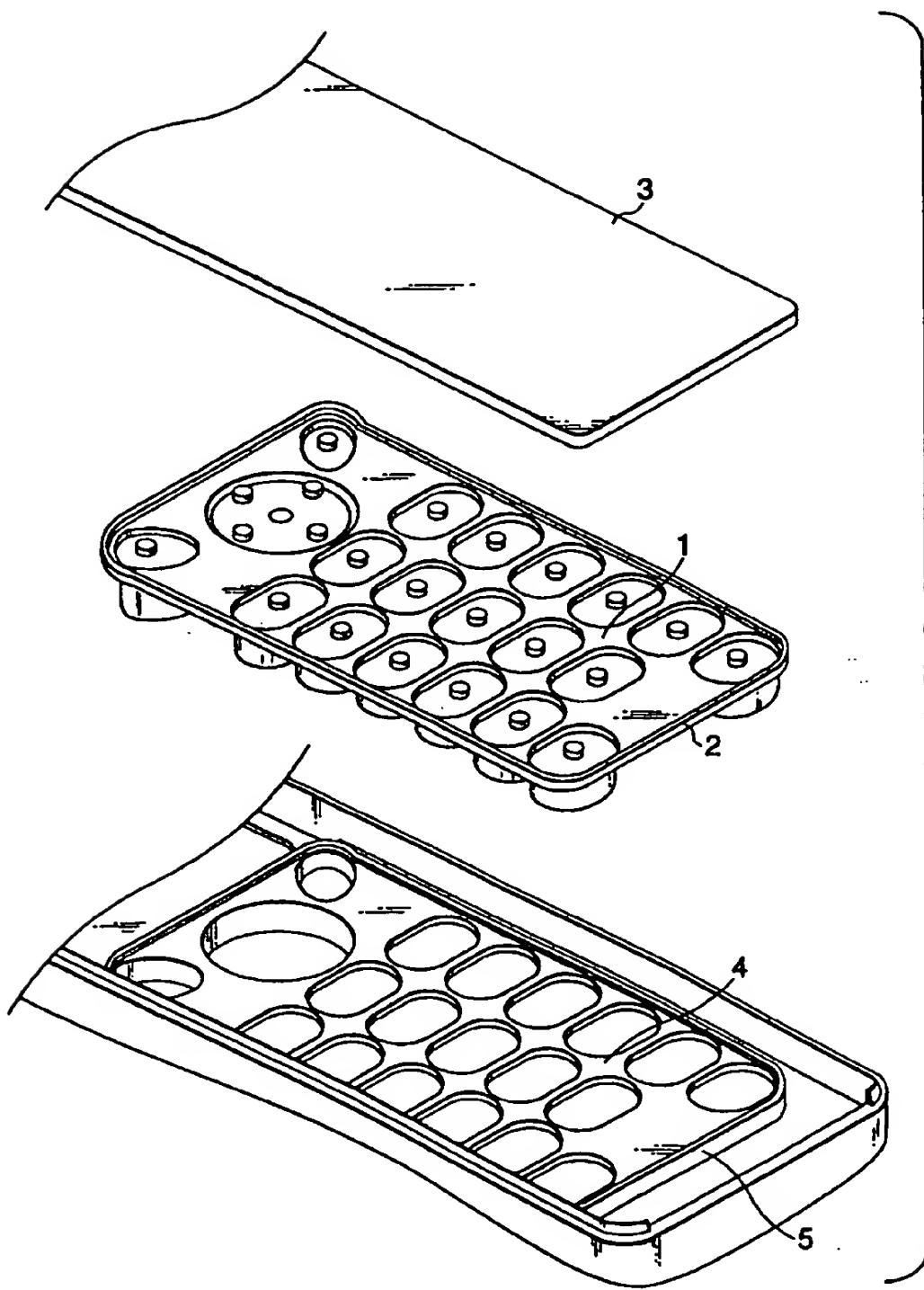


FIG.3

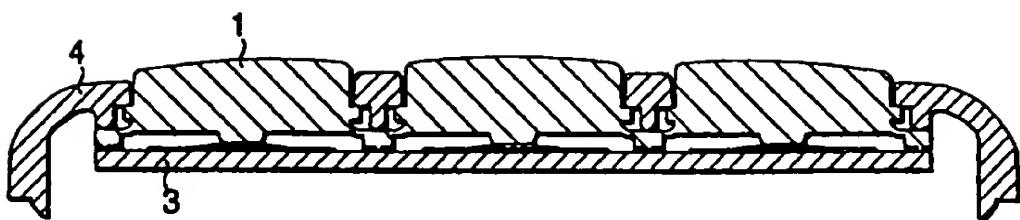


FIG.4A

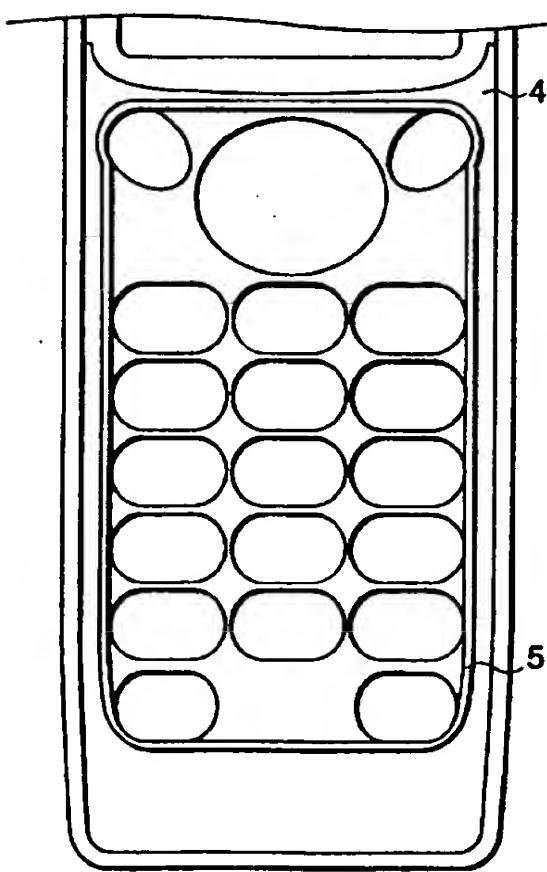


FIG.4B

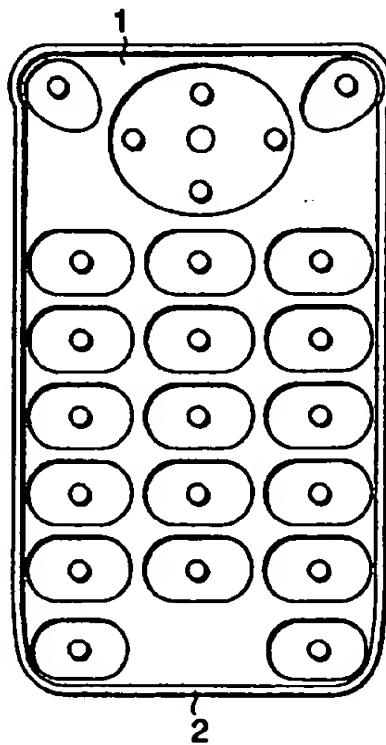


FIG.5A

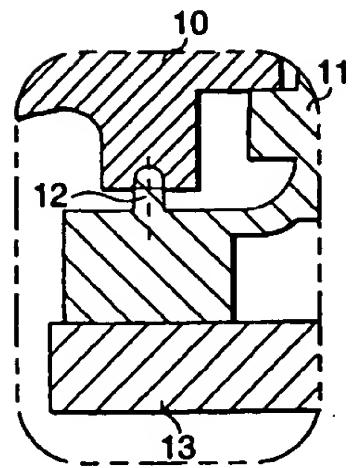


FIG.5B

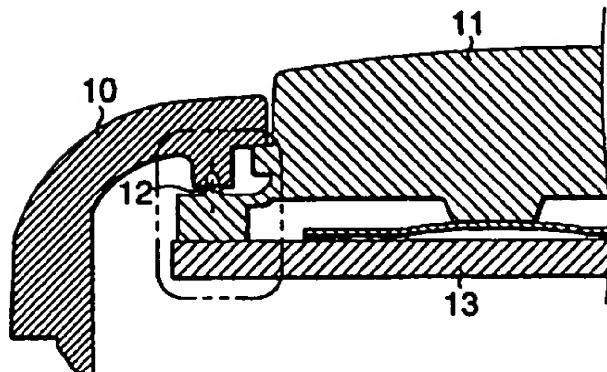


FIG.6A

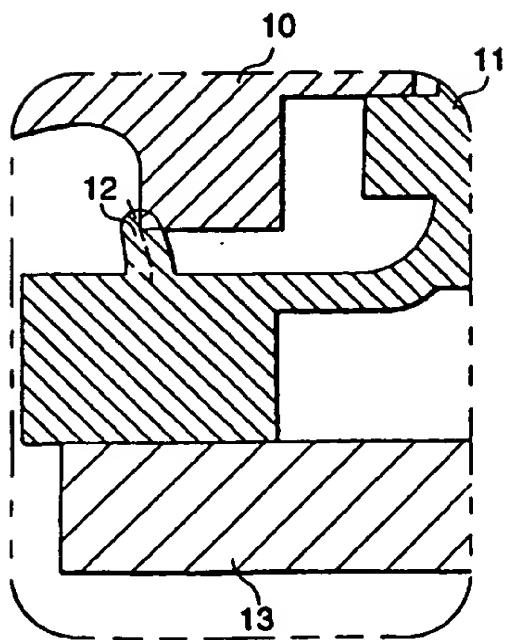
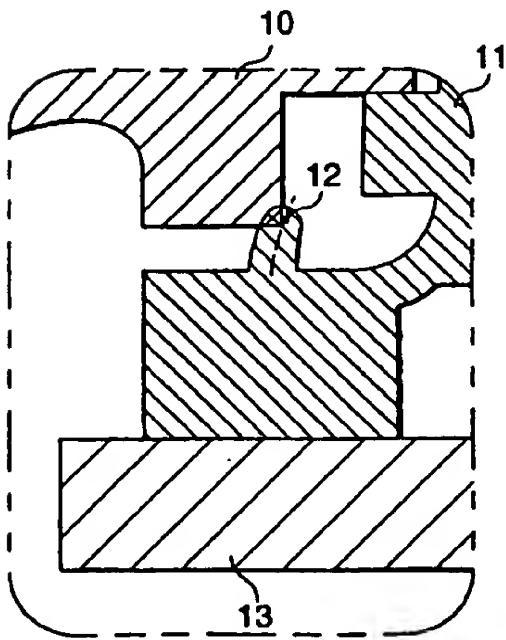


FIG.6B





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## EUROPEAN SEARCH REPORT

Application Number

EP 99 12 2502

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (ECL/7)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	H01H13/70
A	GB 1 543 121 A (SUWA SEIKOSHA KK) 28 March 1979 (1979-03-28) * page 2, line 22 - line 66; figure 3 *	1-12	H01H13/70
A	EP 0 685 954 A (KOKUSAI ELECTRIC CO LTD) 6 December 1995 (1995-12-06) * column 3, line 5 - column 4, line 41; figures 1-5 *	1-12	
A	US 5 734 136 A (NEWCOMER KIMBERLY R ET AL) 31 March 1998 (1998-03-31) * column 3, line 7 - column 4, line 15; figures 3-6 *	1-12	
A	DE 30 38 613 A (CASIO COMPUTER CO LTD) 30 April 1981 (1981-04-30) * page 10, line 8 - line 22; figure 4 *	1-12	
			TECHNICAL FIELDS SEARCHED (ECL/7)
			H01H H05K
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Signature	
THE HAGUE	14 February 2000	Ramirez Fueyo, M	
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